



# 6

SEQUENCE LISTING

<110> Cornell Research Foundation

Chang, Yung-Fu

PE ✓

<120> Ehrlichia canis Genes for Vaccine Development

<130> CRF 2322 CIP

<160> 13

<170> PatentIn version 3.1

<210> 1

<211> 5299

<212> DNA

<213> Ehrlichia canis

<220>

<221> gene

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<213> Ehrlichia canis

<220>

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<222> (1)..(522)

<223> Protein translated from nucleotides 12 through 533 (cytochrome oxidase homolog).

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cta tct atg ata tgt tta gtg tac gct tct gta cca cta tat agt ata 96

Leu Ser Met Ile Cys Leu Val Tyr Ala Ser Val Pro Leu Tyr Ser Ile

20 25 30

ttt tgt aaa gta aca ggt tat gga ggt aca gta aga aca agt aat ata 144

Phe Cys Lys Val Thr Gly Tyr Gly Gly Thr Val Arg Thr Ser Asn Ile

35

40

45

tca aat tct aaa ata ggt aac act att att aaa gtc aga ttt aat gca 192

Ser Asn Ser Lys Ile Gly Asn Thr Ile Ile Lys Val Arg Phe Asn Ala

50

55

60

gat ata cac aaa caa ctg cca tgg aaa ttc tat cca gaa gta tct cat 240

Asp Ile His Lys Gln Leu Pro Trp Lys Phe Tyr Pro Glu Val Ser His

65

70

75

80

gta ttt gta aaa cca gga gaa caa aaa ttg att ttc tac cgc gca gaa 288

Val Phe Val Lys Pro Gly Glu Gln Lys Leu Ile Phe Tyr Arg Ala Glu

85

90

95

aat cta ctt gat gag gac act tca gga atg gct gta tat aat gtt aca 336

Asn Leu Leu Asp Glu Asp Thr Ser Gly Met Ala Val Tyr Asn Val Thr

100

105

110

cca cat aaa gta gga aaa tat ttt aat aag gta gct tgt ttt tgt ttc 384

Pro His Lys Val Gly Lys Tyr Phe Asn Lys Val Ala Cys Phe Cys Phe

115

120

125

acc aaa caa aca tta tac cct cat caa aaa act ata atg cca gta tca 432

Thr Lys Gln Thr Leu Tyr Pro His Gln Lys Thr Ile Met Pro Val Ser

130

135

140

ttt ttt ata gat cca gcc ata gaa aca gat cct gaa act gct gac gta 480  
 Phe Phe Ile Asp Pro Ala Ile Glu Thr Asp Pro Glu Thr Ala Asp Val  
 145 150 155 160

aaa ctc atc act ctt tca tat gta ttc ttt aag tac aaa gaa 522  
 Lys Leu Ile Thr Leu Ser Tyr Val Phe Phe Lys Tyr Lys Glu  
 165 170

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<213> Ehrlichia canis

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Met Lys Pro Arg Ile Arg Asn Thr Ile Tyr Gly Leu Ile Ala Ile Ile  
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Leu Ser Met Ile Cys Leu Val Tyr Ala Ser Val Pro Leu Tyr Ser Ile  
 20 25 30

Phe Cys Lys Val Thr Gly Tyr Gly Gly Thr Val Arg Thr Ser Asn Ile  
 35 40 45

Ser Asn Ser Lys Ile Gly Asn Thr Ile Ile Lys Val Arg Phe Asn Ala

50

55

60

Asp Ile His Lys Gln Leu Pro Trp Lys Phe Tyr Pro Glu Val Ser His

65

70

75

80

Val Phe Val Lys Pro Gly Glu Gln Lys Leu Ile Phe Tyr Arg Ala Glu

85

90

95

Asn Leu Leu Asp Glu Asp Thr Ser Gly Met Ala Val Tyr Asn Val Thr

100

105

110

Pro His Lys Val Gly Lys Tyr Phe Asn Lys Val Ala Cys Phe Cys Phe

115

120

125

Thr Lys Gln Thr Leu Tyr Pro His Gln Lys Thr Ile Met Pro Val Ser

130

135

140

Phe Phe Ile Asp Pro Ala Ile Glu Thr Asp Pro Glu Thr Ala Asp Val

145

150

155

160

Lys Leu Ile Thr Leu Ser Tyr Val Phe Phe Lys Tyr Lys Glu

165

170

<210> 4

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<222> (1)..(1314)

<223> Protein translated from nucleotides 939 through 2,252 (ProA).

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1 5 10 15

aat cat gct tta tcc ttt aac att aaa gtt aca cat gaa aaa tta gat 96

Asn His Ala Leu Ser Phe Asn Ile Lys Val Thr His Glu Lys Leu Asp

20 25 30

aat gga atg gaa gta tac gtg att cca aat cat cgc gca cca gca gtc 144

Asn Gly Met Glu Val Tyr Val Ile Pro Asn His Arg Ala Pro Ala Val

35 40 45

atg cac atg gta tta tac aaa gtc ggt gga act gat gat cca gta gga 192

Met His Met Val Leu Tyr Lys Val Gly Gly Thr Asp Asp Pro Val Gly

50

55

60

tac tct gga tta gca cat ttt ttt gaa cac tta atg ttt agt gga aca 240

Tyr Ser Gly Leu Ala His Phe Phe Glu His Leu Met Phe Ser Gly Thr

65

70

75

80

gaa aaa ttt cct aat ctc atc agc aca ctt agt aat ata ggc gga aat 288

Glu Lys Phe Pro Asn Leu Ile Ser Thr Leu Ser Asn Ile Gly Gly Asn

85

90

95

ttc aat gca agc aca tct caa ttt tgt act ata tac tac gaa tta ata 336

Phe Asn Ala Ser Thr Ser Gln Phe Cys Thr Ile Tyr Tyr Glu Leu Ile

100

105

110

cca aaa caa tat tta tct ctt gca atg gat att gaa tca gac aga atg 384

Pro Lys Gln Tyr Leu Ser Leu Ala Met Asp Ile Glu Ser Asp Arg Met

115

120

125

cag aat ttt aag gtt acc gac aaa gca tta ata aga gaa caa aag gta 432

Gln Asn Phe Lys Val Thr Asp Lys Ala Leu Ile Arg Glu Gln Lys Val

130

135

140

gtc tta gaa gaa aga aaa atg aga gtt gaa agc caa gca aaa aac ata 480

Val Leu Glu Glu Arg Lys Met Arg Val Glu Ser Gln Ala Lys Asn Ile

145

150

155

160

cta gaa gaa gaa atg gaa aat gca ttt tat tac aat gga tat ggc aga 528

Leu Glu Glu Glu Met Glu Asn Ala Phe Tyr Tyr Asn Gly Tyr Gly Arg

165

170

175

cca gta gta gga tgg gaa cat gaa att agc aac tac aac aaa gaa gtt 576

Pro Val Val Gly Trp Glu His Glu Ile Ser Asn Tyr Asn Lys Glu Val

180

185

190

gct gaa gcc ttt cat aag cta cat tat agt cct aat aat gct ata tta 624

Ala Glu Ala Phe His Lys Leu His Tyr Ser Pro Asn Asn Ala Ile Leu

195

200

205

att gta act gga gat gca gat cca caa gaa gta atc aca ctt gca aaa 672

Ile Val Thr Gly Asp Ala Asp Pro Gln Glu Val Ile Thr Leu Ala Lys

210

215

220

caa tac tat ggg aaa ata cca tct aat aat aag aaa cct tca agt caa 720

Gln Tyr Tyr Gly Lys Ile Pro Ser Asn Asn Lys Lys Pro Ser Ser Gln

225

230

235

240

gtt agg gta gaa cca ccg cat aaa aca aat atg act tta aca tta aaa 768

Val Arg Val Glu Pro Pro His Lys Thr Asn Met Thr Leu Thr Leu Lys

245

250

255

gac agt tca gta gaa atc cca gaa ctg ttt tta atg tat caa ata cca 816

Asp Ser Ser Val Glu Ile Pro Glu Leu Phe Leu Met Tyr Gln Ile Pro

260

265

270

aat ggt att acc aat aaa aac tac ata ctt aac atg atg tta gca gaa 864

Asn Gly Ile Thr Asn Lys Asn Tyr Ile Leu Asn Met Met Leu Ala Glu

275

280

285

ata ctc ggt agt ggt aaa ttc agc ctg ctt tac aat gat ttg gta att 912

Ile Leu Gly Ser Gly Lys Phe Ser Leu Leu Tyr Asn Asp Leu Val Ile

290

295

300

aac aat cca ata gtt aca tcg ata aaa aca gat tat aat tac tta act 960

Asn Asn Pro Ile Val Thr Ser Ile Lys Thr Asp Tyr Asn Tyr Leu Thr

305

310

315

320

gac agc gat aat tac ctt tcc att gaa gct ata cct aaa aac ggg atc 1008

Asp Ser Asp Asn Tyr Leu Ser Ile Glu Ala Ile Pro Lys Asn Gly Ile

325

330

335

tct aca gaa gct gta gaa caa gaa att cat aaa tgt ata aat aat tat 1056

Ser Thr Glu Ala Val Glu Gln Glu Ile His Lys Cys Ile Asn Asn Tyr

340

345

350

tta gaa aat gga att tca gca gaa tat tta gaa agt gca aag tat aaa 1104

Leu Glu Asn Gly Ile Ser Ala Glu Tyr Leu Glu Ser Ala Lys Tyr Lys

355

360

365

gta aaa gca cat tta act tat gca ttt gac gga cta act ttc ata tca 1152

Val Lys Ala His Leu Thr Tyr Ala Phe Asp Gly Leu Thr Phe Ile Ser

370

375

380

tat ttt tat ggc atg cat cta ata cta gga gta ccg cta tca gaa atc	1200
Tyr Phe Tyr Gly Met His Leu Ile Leu Gly Val Pro Leu Ser Glu Ile	
385                                      390                                      395                                      400	

agt aat att tac gat acc ata gac aaa gta agt atc caa gat gtt aac	1248
Ser Asn Ile Tyr Asp Thr Ile Asp Lys Val Ser Ile Gln Asp Val Asn	
405                                      410                                      415	

tcc gct atg gaa aat atc ttt caa aac aat ata aga tta acc ggg cat	1296
Ser Ala Met Glu Asn Ile Phe Gln Asn Asn Ile Arg Leu Thr Gly His	
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tta tta cct aat gga gaa	1314
Leu Leu Pro Asn Gly Glu	
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<211> 438

<212> PRT

<213> Ehrlichia canis

<400> 5

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Asn His Ala Leu Ser Phe Asn Ile Lys Val Thr His Glu Lys Leu Asp

20

25

30

Asn Gly Met Glu Val Tyr Val Ile Pro Asn His Arg Ala Pro Ala Val

35

40

45

Met His Met Val Leu Tyr Lys Val Gly Gly Thr Asp Asp Pro Val Gly

50

55

60

Tyr Ser Gly Leu Ala His Phe Phe Glu His Leu Met Phe Ser Gly Thr

65

70

75

80

Glu Lys Phe Pro Asn Leu Ile Ser Thr Leu Ser Asn Ile Gly Gly Asn

85

90

95

Phe Asn Ala Ser Thr Ser Gln Phe Cys Thr Ile Tyr Tyr Glu Leu Ile

100

105

110

Pro Lys Gln Tyr Leu Ser Leu Ala Met Asp Ile Glu Ser Asp Arg Met

115

120

125

Gln Asn Phe Lys Val Thr Asp Lys Ala Leu Ile Arg Glu Gln Lys Val

130

135

140

Val Leu Glu Glu Arg Lys Met Arg Val Glu Ser Gln Ala Lys Asn Ile

145

150

155

160

Leu Glu Glu Glu Met Glu Asn Ala Phe Tyr Tyr Asn Gly Tyr Gly Arg

165

170

175

Pro Val Val Gly Trp Glu His Glu Ile Ser Asn Tyr Asn Lys Glu Val

180

185

190

Ala Glu Ala Phe His Lys Leu His Tyr Ser Pro Asn Asn Ala Ile Leu

195

200

205

Ile Val Thr Gly Asp Ala Asp Pro Gln Glu Val Ile Thr Leu Ala Lys

210

215

220

Gln Tyr Tyr Gly Lys Ile Pro Ser Asn Asn Lys Lys Pro Ser Ser Gln

225

230

235

240

Val Arg Val Glu Pro Pro His Lys Thr Asn Met Thr Leu Thr Leu Lys

245

250

255

Asp Ser Ser Val Glu Ile Pro Glu Leu Phe Leu Met Tyr Gln Ile Pro

260

265

270

Asn Gly Ile Thr Asn Lys Asn Tyr Ile Leu Asn Met Met Leu Ala Glu

275

280

285

Ile Leu Gly Ser Gly Lys Phe Ser Leu Leu Tyr Asn Asp Leu Val Ile

290

295

300

Asn Asn Pro Ile Val Thr Ser Ile Lys Thr Asp Tyr Asn Tyr Leu Thr

305

310

315

320

Asp Ser Asp Asn Tyr Leu Ser Ile Glu Ala Ile Pro Lys Asn Gly Ile

325

330

335

Ser Thr Glu Ala Val Glu Gln Glu Ile His Lys Cys Ile Asn Asn Tyr

340

345

350

Leu Glu Asn Gly Ile Ser Ala Glu Tyr Leu Glu Ser Ala Lys Tyr Lys

355

360

365

Val Lys Ala His Leu Thr Tyr Ala Phe Asp Gly Leu Thr Phe Ile Ser

370

375

380

Tyr Phe Tyr Gly Met His Leu Ile Leu Gly Val Pro Leu Ser Glu Ile

385

390

395

400

Ser Asn Ile Tyr Asp Thr Ile Asp Lys Val Ser Ile Gln Asp Val Asn

405

410

415

Ser Ala Met Glu Asn Ile Phe Gln Asn Asn Ile Arg Leu Thr Gly His

420

425

430

Leu Leu Pro Asn Gly Glu

435

<210> 6

<211> 1353

<212> DNA

<213> Ehrlichia canis

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<221> CDS

<222> (1)..(1353)

<223> Protein translated from nucleotides 2,258 through 3,610 (ProB).

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1 5 10 15

aat aca tat gca aat gat ctc aat att aac ata aaa gaa gct aca act 96

Asn Thr Tyr Ala Asn Asp Leu Asn Ile Asn Ile Lys Glu Ala Thr Thr

20 25 30

aaa aat aaa ata cac tat cta tat gtt gaa cat cat aac cta cca aca 144

Lys Asn Lys Ile His Tyr Leu Tyr Val Glu His His Asn Leu Pro Thr

35 40 45

att tcc tta aaa ttt gca ttc aag aaa gca gga tac gct tat gat gcc 192

Ile Ser Leu Lys Phe Ala Phe Lys Lys Ala Gly Tyr Ala Tyr Asp Ala

50 55 60

ttt gat aag caa gga ctt gca tac ttt aca tca aaa ata tta aac gaa 240

Phe Asp Lys Gln Gly Leu Ala Tyr Phe Thr Ser Lys Ile Leu Asn Glu

65 70 75 80

gga tca aaa aac aac tat gct ctc agt ttt gca caa caa tta gaa ggc 288

Gly Ser Lys Asn Asn Tyr Ala Leu Ser Phe Ala Gln Gln Leu Glu Gly

85

90

95

aaa ggt ata gac tta aaa ttt gat ata gac cta gac aat ttt tat ata 336

Lys Gly Ile Asp Leu Lys Phe Asp Ile Asp Leu Asp Asn Phe Tyr Ile

100

105

110

tca tta aaa acc tta tca gaa aac ttt gaa gaa gcc cta gtt tta ctc 384

Ser Leu Lys Thr Leu Ser Glu Asn Phe Glu Glu Ala Leu Val Leu Leu

115

120

125

agt gat tgc ata ttc aac acc gtc aca gat caa gaa ata ttc aat aga 432

Ser Asp Cys Ile Phe Asn Thr Val Thr Asp Gln Glu Ile Phe Asn Arg

130

135

140

ata ata gca gaa cag att gca cat gtt aaa tca tta tat tct gct cct 480

Ile Ile Ala Glu Gln Ile Ala His Val Lys Ser Leu Tyr Ser Ala Pro

145

150

155

160

gaa ttt ata gct aca aca gaa atg aat cac gct ata ttc aaa ggg cac 528

Glu Phe Ile Ala Thr Thr Glu Met Asn His Ala Ile Phe Lys Gly His

165

170

175

cca tat tct aac aaa gtt tac ggg aca tta aat aca atc aat aat atc 576

Pro Tyr Ser Asn Lys Val Tyr Gly Thr Leu Asn Thr Ile Asn Asn Ile

180

185

190

aac cag gaa gac gtt gca tta tat ata aaa aat agt ttt gac aag gaa 624

Asn Gln Glu Asp Val Ala Leu Tyr Ile Lys Asn Ser Phe Asp Lys Glu

195

200

205

caa atc gtt atc agc gca gca gga gat gta gat cca aca cag cta tca 672

Gln Ile Val Ile Ser Ala Ala Gly Asp Val Asp Pro Thr Gln Leu Ser

210

215

220

aat tta cta gat aaa tat att ctt tcc aaa ttg cca tct ggt aat aac 720

Asn Leu Leu Asp Lys Tyr Ile Leu Ser Lys Leu Pro Ser Gly Asn Asn

225

230

235

240

aaa aat acc ata cca gat acg act gtt aat aga gaa gac aca tta tta 768

Lys Asn Thr Ile Pro Asp Thr Thr Val Asn Arg Glu Asp Thr Leu Leu

245

250

255

tat gta cag aga gat gta cca caa agt gtc ata atg ttt gct aca gac 816

Tyr Val Gln Arg Asp Val Pro Gln Ser Val Ile Met Phe Ala Thr Asp

260

265

270

aca gta cca tat cac agc aaa gac tat cat gca tca aac ttg ttc aat 864

Thr Val Pro Tyr His Ser Lys Asp Tyr His Ala Ser Asn Leu Phe Asn

275

280

285

act atg cta ggc gga tta agt ctc aat tca ata tta atg ata gaa tta 912

Thr Met Leu Gly Gly Leu Ser Leu Asn Ser Ile Leu Met Ile Glu Leu

290

295

300

aga gac aag tta gga tta aca tac cat agt agc agt tca cta tct aac 960

Arg Asp Lys Leu Gly Leu Thr Tyr His Ser Ser Ser Ser Leu Ser Asn

305 310 315 320

atg aat cat agt aat gtg cta ttt ggt aca ata ttc act gat aat acc 1008

Met Asn His Ser Asn Val Leu Phe Gly Thr Ile Phe Thr Asp Asn Thr

325 330 335

aca gta aca aaa tgt ata tcc gtc tta aca gat att ata gag cac att 1056

Thr Val Thr Lys Cys Ile Ser Val Leu Thr Asp Ile Ile Glu His Ile

340 345 350

aaa aag tat gga gtt gat gaa gac act ttt gca att gca aaa tct agt 1104

Lys Lys Tyr Gly Val Asp Glu Asp Thr Phe Ala Ile Ala Lys Ser Ser

355 360 365

att acc aac tct ttt att tta tct atg tta aat aac aat aat gtt agt 1152

Ile Thr Asn Ser Phe Ile Leu Ser Met Leu Asn Asn Asn Asn Val Ser

370 375 380

gag ata ttg tta agc tta caa tta cac gat cta gat ccg agt tat att 1200

Glu Ile Leu Leu Ser Leu Gln Leu His Asp Leu Asp Pro Ser Tyr Ile

385 390 395 400

aat aaa tac aat tct tac tac aaa gca ata aca ata gaa gaa gta aat 1248

Asn Lys Tyr Asn Ser Tyr Tyr Lys Ala Ile Thr Ile Glu Glu Val Asn

405 410 415

aaa att gcc aag aaa att tta tct aat gaa tta gta ata att gaa gta 1296

Lys Ile Ala Lys Lys Ile Leu Ser Asn Glu Leu Val Ile Ile Glu Val

420

425

430

gga aaa aac aat aac ata aat ggc aaa caa ata gat gct aaa aaa cac 1344

Gly Lys Asn Asn Asn Ile Asn Gly Lys Gln Ile Asp Ala Lys Lys His

435

440

445

ata ctt ggt

1353

Ile Leu Gly

450

<210> 7

<211> 451

<212> PRT

<213> Ehrlichia canis

<400> 7

Met Arg Asn Ile Leu Cys Tyr Thr Leu Ile Leu Ile Phe Phe Ser Phe

1

5

10

15

Asn Thr Tyr Ala Asn Asp Leu Asn Ile Asn Ile Lys Glu Ala Thr Thr

20

25

30

Lys Asn Lys Ile His Tyr Leu Tyr Val Glu His His Asn Leu Pro Thr

35

40

45

Ile Ser Leu Lys Phe Ala Phe Lys Lys Ala Gly Tyr Ala Tyr Asp Ala

50

55

60

Phe Asp Lys Gln Gly Leu Ala Tyr Phe Thr Ser Lys Ile Leu Asn Glu

65

70

75

80

Gly Ser Lys Asn Asn Tyr Ala Leu Ser Phe Ala Gln Gln Leu Glu Gly

85

90

95

Lys Gly Ile Asp Leu Lys Phe Asp Ile Asp Leu Asp Asn Phe Tyr Ile

100

105

110

Ser Leu Lys Thr Leu Ser Glu Asn Phe Glu Glu Ala Leu Val Leu Leu

115

120

125

Ser Asp Cys Ile Phe Asn Thr Val Thr Asp Gln Glu Ile Phe Asn Arg

130

135

140

Ile Ile Ala Glu Gln Ile Ala His Val Lys Ser Leu Tyr Ser Ala Pro  
145 150 155 160

Glu Phe Ile Ala Thr Thr Glu Met Asn His Ala Ile Phe Lys Gly His  
165 170 175

Pro Tyr Ser Asn Lys Val Tyr Gly Thr Leu Asn Thr Ile Asn Asn Ile  
180 185 190

Asn Gln Glu Asp Val Ala Leu Tyr Ile Lys Asn Ser Phe Asp Lys Glu  
195 200 205

Gln Ile Val Ile Ser Ala Ala Gly Asp Val Asp Pro Thr Gln Leu Ser  
210 215 220

Asn Leu Leu Asp Lys Tyr Ile Leu Ser Lys Leu Pro Ser Gly Asn Asn  
225 230 235 240

Lys Asn Thr Ile Pro Asp Thr Thr Val Asn Arg Glu Asp Thr Leu Leu  
245 250 255

Tyr Val Gln Arg Asp Val Pro Gln Ser Val Ile Met Phe Ala Thr Asp

260

265

270

Thr Val Pro Tyr His Ser Lys Asp Tyr His Ala Ser Asn Leu Phe Asn

275

280

285

Thr Met Leu Gly Gly Leu Ser Leu Asn Ser Ile Leu Met Ile Glu Leu

290

295

300

Arg Asp Lys Leu Gly Leu Thr Tyr His Ser Ser Ser Ser Leu Ser Asn

305

310

315

320

Met Asn His Ser Asn Val Leu Phe Gly Thr Ile Phe Thr Asp Asn Thr

325

330

335

Thr Val Thr Lys Cys Ile Ser Val Leu Thr Asp Ile Ile Glu His Ile

340

345

350

Lys Lys Tyr Gly Val Asp Glu Asp Thr Phe Ala Ile Ala Lys Ser Ser

355

360

365

Ile Thr Asn Ser Phe Ile Leu Ser Met Leu Asn Asn Asn Asn Val Ser

370

375

380

Glu Ile Leu Leu Ser Leu Gln Leu His Asp Leu Asp Pro Ser Tyr Ile

385

390

395

400

Asn Lys Tyr Asn Ser Tyr Tyr Lys Ala Ile Thr Ile Glu Glu Val Asn

405

410

415

Lys Ile Ala Lys Lys Ile Leu Ser Asn Glu Leu Val Ile Ile Glu Val

420

425

430

Gly Lys Asn Asn Asn Ile Asn Gly Lys Gln Ile Asp Ala Lys Lys His

435

440

445

Ile Leu Gly

450

<210> 8

<211> 663

<212> DNA

<213> Ehrlichia canis

<220>

<221> CDS

<222> (1)..(663)

<223> Protein translated from nucleotides 4,132 through 4,794 (mmpA).

<400> 8

atg aaa gct cat agc aca agt ata cgg aac ttt cag cct tta gaa aga 48

Met Lys Ala His Ser Thr Ser Ile Arg Asn Phe Gln Pro Leu Glu Arg

1 5 10 15

gct gct ata atc att gca gtg tta ggt tta gct gca ttc ttg ttt gct 96

Ala Ala Ile Ile Ile Ala Val Leu Gly Leu Ala Ala Phe Leu Phe Ala

20 25 30

gct gct gcc tgc agt gat cgt ttc caa aga ttg caa tta aca aat cca 144

Ala Ala Ala Cys Ser Asp Arg Phe Gln Arg Leu Gln Leu Thr Asn Pro

35 40 45

ttt gta ata gca gga atg gtt ggc ctt gca gtt ctt tta gtt gct tcc 192

Phe Val Ile Ala Gly Met Val Gly Leu Ala Val Leu Leu Val Ala Ser

50 55 60

tta aca gca gca tta agt ata tgc tta act aaa agt aag caa gtc aca 240

Leu Thr Ala Ala Leu Ser Ile Cys Leu Thr Lys Ser Lys Gln Val Thr

65 70 75 80

caa cat gct att aga cat cgc ttt gga tac gag tca agc act tct tct 288

Gln His Ala Ile Arg His Arg Phe Gly Tyr Glu Ser Ser Thr Ser Ser

85

90

95

tct gta ctg ctt gca ata tca ata att tct tta tta ctt gct gca gca 336

Ser Val Leu Leu Ala Ile Ser Ile Ile Ser Leu Leu Leu Ala Ala Ala

100

105

110

ttt tgt gga aag ata atg ggt aat gac aac cca gat cta ttc ttt agc 384

Phe Cys Gly Lys Ile Met Gly Asn Asp Asn Pro Asp Leu Phe Phe Ser

115

120

125

aag atg caa gaa ctc tcc aat cca ctt gtt gtt gca gct att gta gcc 432

Lys Met Gln Glu Leu Ser Asn Pro Leu Val Val Ala Ala Ile Val Ala

130

135

140

gtt tct gtt ttc cta ctc tca ttc gta atg tat gct gca aag aac att 480

Val Ser Val Phe Leu Leu Ser Phe Val Met Tyr Ala Ala Lys Asn Ile

145

150

155

160

ata agt cca gat aaa caa act cac gtt att ata tta tct aat caa caa 528

Ile Ser Pro Asp Lys Gln Thr His Val Ile Ile Leu Ser Asn Gln Gln

165

170

175

act ata gaa gaa gca aaa gta gat caa gga atg aat att ttg tca gca 576

Thr Ile Glu Glu Ala Lys Val Asp Gln Gly Met Asn Ile Leu Ser Ala

180

185

190

gta ctc cca gca gct ggc att gac atc atg act ata gct tct tgt gac 624  
Val Leu Pro Ala Ala Gly Ile Asp Ile Met Thr Ile Ala Ser Cys Asp  
195 200 205

att tta gca gtg agc agc cgg gga tcc tct cag cat caa 663  
Ile Leu Ala Val Ser Ser Arg Gly Ser Ser Gln His Gln  
210 215 220

<210> 9

<211> 221

<212> PRT

<213> Ehrlichia canis

<400> 9

Met Lys Ala His Ser Thr Ser Ile Arg Asn Phe Gln Pro Leu Glu Arg  
1 5 10 15

Ala Ala Ile Ile Ile Ala Val Leu Gly Leu Ala Ala Phe Leu Phe Ala  
20 25 30

Ala Ala Ala Cys Ser Asp Arg Phe Gln Arg Leu Gln Leu Thr Asn Pro  
35 40 45

Phe Val Ile Ala Gly Met Val Gly Leu Ala Val Leu Leu Val Ala Ser

50

55

60

Leu Thr Ala Ala Leu Ser Ile Cys Leu Thr Lys Ser Lys Gln Val Thr

65

70

75

80

Gln His Ala Ile Arg His Arg Phe Gly Tyr Glu Ser Ser Thr Ser Ser

85

90

95

Ser Val Leu Leu Ala Ile Ser Ile Ile Ser Leu Leu Leu Ala Ala Ala

100

105

110

Phe Cys Gly Lys Ile Met Gly Asn Asp Asn Pro Asp Leu Phe Phe Ser

115

120

125

Lys Met Gln Glu Leu Ser Asn Pro Leu Val Val Ala Ala Ile Val Ala

130

135

140

Val Ser Val Phe Leu Leu Ser Phe Val Met Tyr Ala Ala Lys Asn Ile

145

150

155

160

Ile Ser Pro Asp Lys Gln Thr His Val Ile Ile Leu Ser Asn Gln Gln

165

170

175

Thr Ile Glu Glu Ala Lys Val Asp Gln Gly Met Asn Ile Leu Ser Ala

180

185

190

Val Leu Pro Ala Ala Gly Ile Asp Ile Met Thr Ile Ala Ser Cys Asp

195

200

205

Ile Leu Ala Val Ser Ser Arg Gly Ser Ser Gln His Gln

210

215

220

<210> 10

<211> 417

<212> DNA

<213> Ehrlichia canis

<220>

<221> CDS

<222> (1)..(417)

<223> Protein translated from complementary sequence derived from nucleotides 4,883 through 5,299 (partial lipoprotein signal peptidase homolog).

<400> 10

gat cag gta agt aaa tgg tat gta gta aat ttg ata gga gat aaa ggt 48

Asp Gln Val Ser Lys Trp Tyr Val Val Asn Leu Ile Gly Asp Lys Gly

1 5 10 15

gta ata gag ata tta agc ttc ttg cgc ttt act aca gtg tgg aat cct 96

Val Ile Glu Ile Leu Ser Phe Leu Arg Phe Thr Thr Val Trp Asn Pro

20 25 30

gga att agt ttt ggt ata tta aat aac ttt gaa tat agt aat gtt gtt 144

Gly Ile Ser Phe Gly Ile Leu Asn Asn Phe Glu Tyr Ser Asn Val Val

35 40 45

ttt tgt agt atc tcg att ttg att act tgt gtt tta tgc tac tta ttt 192

Phe Cys Ser Ile Ser Ile Leu Ile Thr Cys Val Leu Cys Tyr Leu Phe

50 55 60

ata gta cag cca cat tat aga tta cct ctt gta atc att att ggg ggg 240

Ile Val Gln Pro His Tyr Arg Leu Pro Leu Val Ile Ile Ile Gly Gly

65 70 75 80

tca ata gga aat atc ata gat aga ata aga tat ggt gct gtc tat gat 288

Ser Ile Gly Asn Ile Ile Asp Arg Ile Arg Tyr Gly Ala Val Tyr Asp

85 90 95

ttt ata gat ttt tat atc aat aac tta cat tgg cct gta ttc aac ctg 336

Phe Ile Asp Phe Tyr Ile Asn Asn Leu His Trp Pro Val Phe Asn Leu

100

105

110

gcg gat tct ttt ata ttt tta ggt ata gta ata ata atg gca aag agt 384

Ala Asp Ser Phe Ile Phe Leu Gly Ile Val Ile Ile Met Ala Lys Ser

115

120

125

aat aac cac atg aaa caa att aac tgt aac tcc

417

Asn Asn His Met Lys Gln Ile Asn Cys Asn Ser

130

135

<210> 11

<211> 139

<212> PRT

<213> Ehrlichia canis

<400> 11

Asp Gln Val Ser Lys Trp Tyr Val Val Asn Leu Ile Gly Asp Lys Gly

1

5

10

15

Val Ile Glu Ile Leu Ser Phe Leu Arg Phe Thr Thr Val Trp Asn Pro

20

25

30

Gly Ile Ser Phe Gly Ile Leu Asn Asn Phe Glu Tyr Ser Asn Val Val

35

40

45

Phe Cys Ser Ile Ser Ile Leu Ile Thr Cys Val Leu Cys Tyr Leu Phe

50

55

60

Ile Val Gln Pro His Tyr Arg Leu Pro Leu Val Ile Ile Ile Gly Gly

65

70

75

80

Ser Ile Gly Asn Ile Ile Asp Arg Ile Arg Tyr Gly Ala Val Tyr Asp

85

90

95

Phe Ile Asp Phe Tyr Ile Asn Asn Leu His Trp Pro Val Phe Asn Leu

100

105

110

Ala Asp Ser Phe Ile Phe Leu Gly Ile Val Ile Ile Met Ala Lys Ser

115

120

125

Asn Asn His Met Lys Gln Ile Asn Cys Asn Ser

130

135

&lt;210&gt; 12

<211> 41

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artifical Sequence: oligonucleotide

<400> 12

aggcttggtc agggatgaaga agaatccaac gacaaaagct t

41

<210> 13

<211> 41

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: oligonucleotide

<400> 13

aagcttttgt cggtggattc ttcttcaccc tgaacttgcc a

41